



Radar Data Concerns

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Radar Data Quality Workshop - Data Concerns

- **General Radar Data Issues**
 - **TEP is at the mercy of the tactical radar to a large extent**
 - **Maximum range**
 - **Waveform selection (tactical operation - Clear vs. MTI)**
 - **Power Settings (High vs. Low transmit power)**
 - **Radiation Inhibit Sectors (i.e. radiation dropouts when in flight quarters, etc.)**
 - **Azimuth and Elevation Resolution dictated by SPY-1 antenna physics**
 - **Elevation angles dictated by SPY-1 search pattern**
 - **RF Attenuation Limited by Operation of the Radar**



Radar Data Quality Workshop - Data Concerns

- **Data Transfer Size**
 - **Standard 4-moment UF file approximately 10 Mbytes**
 - **Additional Level III products (Comp Z, Precip. Rate, Echo Top Height, VAD, RFC) increases data size**
 - **possible 50 to 100 percent increase (15 to 20 Mbytes total)**
 - **Sending data every five minutes might overwhelm the finite bandwidth available off-ship**
 - **Assumed values for TEP LOW on USS Normandy - actual bandwidths were lower due to conditions and IT warfare**
 - **~ 43 kBytes / sec via LOS**
 - **~ 8 kBytes / sec via INMARSAT**
 - **Data Compression and Transfer Issues are Vital to Success**



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- **Radial Velocity and Spectrum Width Measurements**
 - **Radial Velocity and Spectrum Width require 3-pulse MTI waveform scheduling or pulse Doppler waveform scheduling**
 - **SPY-1 automatically schedules MTI unless operator overrides radar doctrine**
 - **Pulse Doppler waveform must be implemented and changes tactical operation of radar**
 - **Solution may require forcing radar to schedule MTI dwells to provide velocity estimates to get full velocity coverage or accepting a possibly sparse velocity map due to SPY-1 MTI scheduling**

Need to Address Waveform Selections and Implementation with NSWC-DD



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- **Velocity Azimuth Display (VAD) using 3-Pulse MTI**
 - **VAD can be executed on radial velocity measurements from 3-pulse MTI waveforms**
 - **There are limitations the effectiveness of 3-pulse VAD**
 - **Signal-to-noise ratio in clear air may limit clear air wind detection to a few kilometers**
 - **Areas of sufficient signal return cannot be combined with areas of insufficient signal returns (i.e. noise regions)**
 - **Offset VAD can solve this, but requires a 'smart' VAD algorithm to automatically select regions where sufficient signal exist and use only these regions for VAD**
 - **Offset VAD was done manually in TEP at-sea demo**



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- **Velocity Azimuth Display (VAD) using 3-Pulse MTI**
 - **Limitations the effectiveness of 3-pulse VAD (continued)**
 - **MTI radial velocity accurate when suitable reflectivity is present - however, internal flow in a rain storm may not reflect the flow external of the rain storm**
 - **Off Hawaii, 1999 - Light precip. surrounding ship - good VAD match to radiosonde winds**
 - **Off Jacksonville, 1999 - Strong squall over coast - less accurate VAD match to radiosonde winds**
 - **SPY-1 doctrine dictates use of MTI waveform (see Radial Velocity and Spectrum Width Measurements slide)**

MTI VAD Has Limited Ability

